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Satellite Surveillance of the Sea: the Technical Evidence¹

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Immensity of sea areas, threats and increased risks because of the importance of maritime traffic, enlargement of vessel sizes, emergence of new risks and new threats under the influence of globalization and technologization of the Society... All these factors justify the increasing number of measures and means monitoring human activities at sea. However, it seems not relevant to consider the theory of Big Brother, leader of the fictional country Oceania³, believing in the illusion of a comprehensive and effective control over the entire surface of the Earth.

Nowadays, it appears that everything can be monitored – detectable, observable and controllable. The precision of the statements coming from satellite technologies and the collected information fuel this contemporary fantasy. Diversion of technical means dedicated to the safety of navigation then used for criminal purposes gives us a typical illustration of the duality of the consequences of the implementation of new technical requirements. The Automatic Identification System (AIS) for example, which originally promoted the safety of maritime transit, enables Somali pirates to target the ships to board⁴.

Technology plays an increasing role in the lives of maritime actors. Innovative technical applications are very steadily becoming part of the everyday life of both controllers and controlled people. Developed to meet the requirements of safety and security at sea, these new techniques generate changes in the legal framework of human activities. They turn, sometimes in depth, the standards and the mode of production of the legal norms. The legal concepts of threat and risk are thus subject to changes.

The humanization of technical applications by the law⁵, first revealed by the Labor Law, besieges and goes into the maritime area. The development of satellite applications offers many solutions to practical problems in monitoring. As simple aids to decision adopted by the authorities, the systems combining and interpreting the information include

¹ This paper constitutes the written revised version of a communication performed during the international symposium MARISK, Nantes, France, January 26-27, 2012

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³ Orwell G., 1984, Paris, Gallimard-Folio, 1972, 438 p.

⁴ See for example, Norchi H. C., Proutière-Maulion G. (ed.), *Piracy in Comparative Perspective: Problems, Strategies, Law*, Paris-Londres, Ed. Pedone-Hart, 2012, 448 p.

⁵ Fromm E., *The Revolution of Hope : Toward a Humanized Technology*, New York, Harper and Row, 1970 (revised edition) ; Supiot A., *Homo juridicus. Essai sur la fonction anthropologique du Droit*, Paris, Ed. du Seuil, 2005.

more and more automated features. Even though a real Cyber Law⁶ does not exist as such, the establishment of a maritime version of an *Automatic Fine System* has to be considered.

The technology brings new evidence (more or less reliable) to prove the reality of the threat or risk. It brings support to the judge by giving him some new, innovative but non-legal elements. New information systems impact the standards of evidence. The evolution of legal concepts of threat and risk at sea attests to a transformation of paradigms regarding the admissibility of the evidence. Individual rights are then at the crossroads of the double objective of the new monitoring instruments: under their protection, they are however facing new dangers inherent in the purpose of their use.

The use of satellite technology for maritime surveillance (I) is becoming more widespread because of the advantages that they present for prevention (detection) but also for management (treatment) of the risks and threats at sea. Some technological systems currently operational allow, aboard and ashore, the nearly real-time monitoring of the conditions of navigation, the route, the position of the surrounding vessel, their identity, their cargo... Various spatial means are then put to use and offer, to the crew under supervision as well as the controllers, the possibility of limiting the occurrence of events at sea using communication or visualization tools. However, these systems do not completely exclude all the potential hazards. In the event of litigation, to varying degrees and depending on the legal system in which the action is brought, these technical means may shed light on distant facts and allow the deduction of the relevant responsibilities (II). Considering non-legal but scientific elements, the judge will have to rely on scientific experts what entails a technical approach of the formation of the judgment.

I. The use of satellite capacity for maritime surveillance.

Satellite technology offers the opportunity to remotely monitor human activities at sea. They indicate a willingness to get human and goods flows under control all over the globe. The sea is caught up in a very lucrative business that includes risks and threats, usually well identified, but whose occurrence might be unexpected. While the human dimension – namely the Safeguard of Life at Sea – cannot be excluded from the aims of satellite surveillance, this aspect can be considered as only associated to the desire to secure economic exchanges or to lead to more effective environmental protection. The various deployed space assets and the networking of the national systems using these means (1) demonstrate the magnitude of the phenomenon. Major technological projects allow a real-time tracking of ships, which once combined with extra terrestrial information, is inclined to become the base for the management of State action at sea (2). The technological imperative becomes a keystone of an efficient maritime surveillance across the globe.

1. Networking the national information systems for the establishment of a comprehensive maritime surveillance

Since the launch of Sputnik by the USSR in 1957, more than 5,000 satellites have been put into orbit. Their growing number reveals the expansion of human activities in space, but also on Earth. The areas of use of these devices are very diverse and we retain, for maritime

⁶Wiener N., *Cybernetics, (or Control and Communication in the Animal and the Machine)*, Hermann & Cie éditeurs, Paris, 2^{ème} édition, 1958. Cyber Law is understood as the legal framework applicable to the modelling of exchanges, of the study and feedback of information (system designed to *govern*).

surveillance, three types of material. Remote sensing satellites have generally the characteristic of being sun-synchronous. These polar orbiting satellites observe a part of the Earth submitted to a constant solar luminosity. They are used for scientific (e.g. observation of the thickness of the ice field) or military purposes. Meteorological satellites also belong to this group. They allow for example weather routing or detection of marine pollution. Communications satellites allow data transfer from one point to another point on earth. AIS data, Long Range Identification and Tracking (LRIT) or monitory Vessel System (VMS) pass through these satellites. These data allow the identification of such vessels in transit by any vessel (AIS) or by the competent maritime authorities (AIS, VMS, LRIT). However, all vessels are not compelled to transmit their location. Some are indeed not bound by any legal norm that requires them to be fitted out with the necessary communications equipment. The satellite positioning or navigation can provide the exact location of an object on earth, in air or in space. Systems like the Global Positioning System (GPS, USA) and the Global Navigation Satellite System (GLONASS, Russia) are currently the two major and publicly accessible systems. The ARGOS system allows the location of markers with an accuracy of about 150 meters. 20,000 ARGOS markers are currently used across the world, the smaller weighting 5 grams and they make possible to determine the migration routes of the migratory species. The monitoring of these markers makes more efficient or even simply possible the control of the activity of the fish vessels for example.

The data collected and transferred by satellite means present a great interest to maritime surveillance only if it they are combined with an information system. The two following examples furnish some elements of certain applications launched to harmonize the conditions of sea monitoring within the EU Member States (MS) legal and organizational frameworks.

As to fisheries control, Regulations EC No. 686/97 of 19th April 1997 and EC No. 1489/97 of 30th July 1997 established a European system of satellite surveillance⁷. Under their provisions, MS are required to implement a tracking system for fishing vessels flying their flag. They can then communicate with the authorities of the MS competent in the fishing area. In France, regional centers for operational surveillance and Rescue (CROSS) are responsible for interpreting these data. Naval units of the Maritime Affairs support them for the operational aspects of the control. The system makes possible to assess whether the vessel is fishing or en route. This eases the cost implied by the deployment of naval or air means to find and control the activities of a vessel suspected of violating the regulations. This also offsets (or even justifies, promotes...) the lack of valuable and available human means. Since January 1st, 2006, VMS data also relates to the speed and route of vessels over 15 meters in overall length (12m, March 1st, 2012). Vessels operating exclusively within 12 nautical miles and/or which never spend more than 24 hours at sea are not bound by this obligation. By using this tracking device, a vessel may communicate its geographical position *via* satellite, simultaneously to the flag State and to the concerned coastal MS, Fisheries monitoring centers (FMC) have been created and are operated either by each Member State, or jointly by several States.

⁷ Commission regulation (EC) No 2244/2003 of 18 December 2003 laying down detailed provisions regarding satellite-based Vessel Monitoring Systems abrogated by Commission Implementing Regulation (EU) No 404/2011 of 8 April 2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy; See Proutière-Maulion G., Leboeuf C., *Police des pêches*, Jurisclasseur environnement, fascicule n° 3895, mars 2012

As to marine pollution, the European Maritime Safety Agency⁸ (EMSA) has set up CleanSeaNet that entered in operation on 16 April 2007. This is a near-real-time satellite-based oil spill and vessel monitoring service, which provides a highly technical support for the supervision of maritime areas. Each coastal state has direct access to the system interface and can thus, on the basis of satellite and radar imagery, guide the actions of operational means to the area to ascertain a suspected infringement. Combining these images with data from other systems, such as for example those from SafeSeaNet (system monitoring maritime traffic, based on AIS emissions, also established by EMSA) allows the identification of vessels that were or are present in the area of an observed marine pollution. SafeSeaNet keeps records of 100 million AIS emissions per month in a database whose subsequent consultation allows assessing some of the navigational and environmental conditions of the incidence of the event.

The aforementioned satellite information systems represent a very small fraction of the systems currently in operation worldwide or in development⁹. The LRIT system implemented by a data recovery center since July 2009 allows the flag state and the State of destination to know the position of the ship in transit through an emission every 6 hours. More secure than the AIS, LRIT cannot be intercepted by malicious people (without a governmental help...). Apart from technical barriers that occur while overlapping and associating information¹⁰, the real difficulty is the pooling of data of maritime interest¹¹.

The European Commission (EC) calls for the establishment of a European network for maritime surveillance. It implies necessarily that all the national systems have to be interoperable. Provided by state authorities, the various maritime surveillance activities consider threats and risks that present transnational features. It requires “*gradual achievement of an integrated network of vessel tracking and e-navigation systems for European coastal waters and the high seas, including satellite monitoring and long range identification and tracking*”¹². However, as demonstrated by the recent SafeSeaNet Workshop held in Lisbon on 18 and 19 October 2011, the issue of information exchange is a very important one. States underline both legal and technical difficulties. Indeed, beyond the problem of establishing a common vocabulary for all the different actors, there are big questions about the exchange and storage of data¹³ between the competent authorities of Member States.

⁸ European Parliament and Council Directive 2005/35/EC of 7 September 2005, as amended by Directive 2009/123/EC of 21 October 2009 on ship-source pollution and on the introduction of penalties, including criminal penalties, for pollution offences

⁹ See Holsten S., « Global Maritime Surveillance with satellite-based AIS », Bremen, OHB-Syst. AG, *Oceans 2009-Europe*, 4 p. ; Claisse S., Morel M., Ormsby W.B., « Enhanced maritime surveillance and information system for abnormal behaviour identification », in *2010 International Waterside Security Conference Proceedings*, 5 p. ; Guerrierio M. (Univ. Connecticut, USA), Willett P., Coraluppi S., Carthel C., « RADAR/AIS data fusion and SAR tasking for maritime surveillance », in *11th International Conference on Information Fusion Proceedings*, 2008, 5 p.

¹⁰ Graziano M., D’Errico M., Razanno E., « Maritime surveillance by integrating remote sensing and AIS: a preliminary analysis », in *OCEANS 2011*, 2011, 9 p.

¹¹ Leboeuf C., « Collecte et utilisation de l’information en matière de surveillance du domaine maritime : le cas des luttes contre les pollutions marines et l’immigration clandestine », in *Revue de Droit des Transports*, juillet-août 2011, n° 7-8, p. 8-13

¹² EC, Communication, *An Integrated Maritime Policy for the European Union*, Brussels, 10.10.2007, COM (2007) 575 final, p. 5

¹³ EMSA, *Workshop Report, SafeSeaNet Workshop 16* des 18-19 October 2011, Lisbon, version 1.0, 28 nov. 2011, p.6. The UK has particularly raised the fact that some incident reports should be disclosed only to ports because of the sensitivity of commercial information.

2. Privatization of maritime transit monitoring

The maritime world now faces a great multiplication of its actors quite unlike the previous centuries. The growing willingness to secure the profits thrives on the phenomenon of globalization, diversification of activities but also of threats and risks, on land and at sea, having a more or less direct link with the sea. The privatization of the security of the economic exchanges has become of very high interest. It includes weather routing.

The Fleet Centers, routing companies working for the armaments, advise the captain and offer him the best navigational options as to weather conditions. These companies have a real time display of the vessel position and record the entire transit route. Such practices generate a lot of issues among which is the autonomy of the captain's choice of route. When an event occurs, the liability resulting from the disregard of the advice issued by the private center routing has to be questioned.

The captain of a ship may be subjected to further internal disciplinary action when one of its business functions is questioned. Decisions about navigation being not observable, it seems that no captain could be sanctioned on this basis. However, the increasing number of duties and responsibilities of the master, coupled with ongoing monitoring of its transit activities, directly jeopardizes the autonomy of the captain. In terms of responsibility, this situation is not that different from the one at the entrance of a port. Indeed, "*a captain, who does not follow the pilot's advice would take responsibility for damage, which explains that he scrutinizes the advice and balance the risks of following it or not*"¹⁴. The International Convention on Standards of Training, Certification and Watchkeeping (STCW) has been transposed in France by the Decree of 22 June 1998 on the responsibilities of companies and crew¹⁵. It deals directly with the applicable liability regime in case of navigation with a pilot on board. No such obligation results from any law or convention as to the routing center.

"*The pilot ensures [...] a public service but is also a private law actor*"¹⁶. His private status stems from the fact he enters into a (*sui generis*) contract with the captain. The legal consequences of the advices given by the routing center could be considered regarding the litigation arising from activities of marine pilot¹⁷. Nevertheless, nothing requires the captain to follow the advices of a private company as to navigation issues, unless it is the unregulated commercial pressure of the shipowner... Marine pilots "*contribute to the performance of the public service*"¹⁸ in order to ensure the security and safety of the marine environment, port infrastructure or even of the trade flows. Community case law has assumed the general economic interest of the activities of the maritime pilots that justifies a

¹⁴ Laffoucrière F., « La responsabilité disciplinaire et pénale du pilote maritime », in *Droit Maritime Français*, February 2011, n° 722

¹⁵ as amended by *arrêté du 11 mai 2005*, JORF n° 123, May 18, 2005, p. 9401

¹⁶ Laffoucrière F., « La responsabilité civile du pilote », in *Droit Maritime Français*, July 2008, n° 722

¹⁷ Note that historically, (in France) the first legal norms basing a responsibility of the maritime pilot seem to have been embedded in the *Rôles d'Oléron*, § 33-34, then in the *Ordonnance de la Marine* (1681) of later in a decree (December 12, 1806)

¹⁸ Conseil d'Etat (CE), *Exbrayat*, December 13, 1929, Rec. CE, p. 1113, concl. Josse

restriction of the principle of free movement and the monopoly they enjoy¹⁹. Even though activities of the routing centers guarantee in some way the safety of the crew and of the marine environment, they do not enjoy such legal privileges.

As to the regime of responsibility or liability of the captain, in case of harmful consequences involving advices of a maritime pilot or a company routing, it may seem easy to assess that the precedents' solutions are similar. The master of a ship has discretion for ship security, which means he is entitled not to follow the recommendations of the fleet center²⁰ or of the maritime pilot. However, these two situations are different since different economic interests are at stake. Not to follow the recommendations of a maritime pilot would not, except in some exceptional cases, lead to too high costly delays. The recommendations of a routing center have a different scope especially if the charter party provides for the completion of the journey "*with the utmost dispatch*"²¹. Not to take the advice of a society might lead to extra costs and a longer journey. But the choice to be made by the master is not easy when security or/and safety of navigation collide with commercial imperatives.

The technical facilities and their use have led to new legal, social and economic situations. They make possible a real-time monitoring of the activities of the captain at sea and not only in defined areas, known to be dangerous or sensitive. The nub of the matter is "*the emergence of modern technology in navigation*"²². The scope of clauses of charter parties varies under the impact of new communication technologies and weather forecasting means... These clauses actually raise a fundamental question as they concern directly the (re-)routing measures recommended by a center employed by the shipowner, whose captain is the agent on board... The predictability of weather-related hazards associated with a real-time visualization of the location of the ship confers the power on the shipowner to monitor the captain's route options. It can be seen as a control of the commercial activities of the captain. "*Who ultimately will decide: Captain or routing society?*"²³ Immediacy of the advices generates psychological consequences on the activity, the role and the status of the master of a ship.

The networking of maritime surveillance systems, whether private or public, is one of the great challenges of the early twenty-first century. Interoperability is a technical imperative. From the perspective of cooperation between the actors controlling the human activities at sea, the public-private relations have to be organized even though the two dimensions are pursuing different interests. Technologization of the surveillance and inspection rules does not distinguish between private and public spheres. It interferes in all areas and is now a component of the very organization of the maritime activities. Technologization invests as well the field of litigation. The use of scientific theories in the courts is becoming more and more prevalent as a direct result of the use of advanced technical systems. Science and its applications allow management and maritime surveillance

¹⁹ ECJ, case C-157/94 *Commission v Netherlands* [1997] ECR I-5699 ; The French Federation of Maritime Pilots nevertheless noted that the will of the European Commission to "review the restrictions on service delivery port" (European Commission, White Paper on Transport, 28 March 2011, COM(2011) 144 final, p.21) has opened "*the way for the liberalization of marine pilotage*" (C. Martin, "Marine Pilotage: the profession refuses liberalization planned by Brussels", Journal of the Merchant Marine 1st June 2011).

²⁰ New York arbitration award, *Reefer Express Lines Pty Ltd v. Cool Carriers AB*, SMA 3257, 24 janv. 1996

²¹ Case *Harmony Hill*, Charterparty, clause 8; See Vachias Y., « Routage météorologique. Le capitaine est-il toujours libre de son choix de route ? », in *Annuaire de Droit Maritime et Océanique*, 2012

²² Simon P., « Les clauses de routage », in *Droit Maritime Français*, 2007, n° 684

²³ *Ibid.*

to be more effective. In case of litigation however, there exists a huge need for clarification that only specialists can provide. Scientific expertise becomes thus a key element and a reality in the drawing up of the judgments.

II. Scientific expertise of evidences arisen out of technological systems

Technification of the modalities of the sea surveillance and control induces a complexification of maritime disputes. The rules on admissibility of evidence must adapt to the widespread use of technical applications. The very sequence of the trial is changed, is influenced. Technologisation of maritime activities and their management reopens in a sense controversy about technical versus moral norms, initiated notably by the medical law²⁴. Does Science know best how to prove and demonstrate the involved responsibilities or liabilities? Who to trust and why? Do technological proofs have the same or even a better legal value than oral, human evidences? Are they trust worthier? During litigation, technical elements are not perceived and received in the same manner depending on the legal systems (1). Technical elements have a slightly different value in Anglo-Saxon and Continental legal traditions. However, each system provides a central place to the scientific expertise that interprets these techniques and enlightens the judge (2).

1. The admissibility of the technical evidence in the legal Anglo-Saxon and Continental systems

The admissibility of evidence during a trial depends essentially on the legal system in which the case is introduced. These systems are indeed the transcription of values and norms that have been formed during the past centuries. They also demonstrate the heterogeneity of the notions of Justice in the world. International Justice has had the opportunity to file and examine technical exhibits stemming directly from a satellite application. In a case introduced in 1996 about boundaries delimitation between Botswana to Namibia, the International Court of Justice established in 1999 the provisions of its judgment on the basis of *“aerial photographs of the area concerned taken between 1925 and 1985 show a northern channel that is wider than the southern one. The satellite pictures taken in June 1975 then in March 1995 and June 1996 - i.e. in both the dry and rainy seasons - show the northern channel as being wider than the southern channel. The Court concludes that apart from the season of flooding that is indeed the situation”*²⁵. This decision does obviously not imply a generalization of the use of satellite images in such cases.

In the USA, the hearsay rule²⁶ defines the admissibility of oral evidences and deals more specifically with a declaration made in court by a person who has no direct connection with the alleged fact. Strict application of this rule precludes admissibility of satellite pictures. This rule is however full of subtleties. It is admitted in Anglo-Saxon legal systems that the satellite record alone is not conclusive. In case of litigation, it is nevertheless of great interest. Its probative value derives from an expert's testimony based on his own scientific

²⁴ Gregg Bloch M., « The Invention of Health Law » in *California Law Review*, vol. 91, March 2003, n°2, 247-322

²⁵ ICJ, *Kasikili/Sedudu Island (Botswana/Namibia.) Judgment, I. C.J. Rrport.~1999*, p. 1045, § 33

²⁶ Federal Rules of Evidence, Rules 801-807, as amended to December 1, 2011, [available at:] <http://www.law.cornell.edu/rules/fre>

knowledge. The supporting scientific arguments make the technical element become an evidence, exhibit or proof. A relatively well-stocked American jurisprudence holds the satellite readings as evidence²⁷. Several cases deal about the location of incidents established by satellite photography²⁸. Some techniques of observation and image capture are even recognized by the courts as sufficiently reliable not to require an evaluation of their dependability. The *NutraSweet Co. v. XL Engineering Co.* case²⁹ (2000) established that techniques of interpretation of aerial photos were sufficiently accepted by the scientific community to accept these pictures as evidence without being questioned. CCTV in the United Kingdom, associated with a treatment information system, makes possible the sentencing of fines that are automatically addressed to the vehicle users whose license plates have been scanned³⁰. Using very complex processes, sometimes occurring in a context of fighting terrorism³¹, its generalization is already very well advanced³².

Reliability of information acquisition techniques used for the purposes of litigation has been going on for some time, but the issue has not been resolved. Indeed, is the technical proof more reliable than traditional evidence (confession, testimony, minutes...)? The analysis of police practices demonstrates that the technical proof is in fact more reliable as it is a technological extension of the officer³³. The data acquisition systems, including satellite ones, are finally not more than the technicized arm of the judicial body. The dual legal system of South Africa, combining both common law and civil law has adopted specific legislation regarding the admissibility of evidence in fisheries litigation. The declaration outlined the features of the required cameras that capture the images as well as the characteristics of the taken shots themselves³⁴.

In continental law, the rules of evidence state that a sole technical element would not ground for liability. In fisheries control, only the presence of an official report drawn up by an enforcement officer will introduce a statement or a satellite photograph as exhibit. Regardless of the fact that the burden of proof depends essentially on the principle of legality (a proof cannot be given through an unfair or illegal practice), the evidence can be produced by any means. The French Code of Criminal Procedure provides in this regard that "*except in cases where the law provides otherwise, the offenses may be proved by any mode of proof and the judge decides according to his personal conviction*"³⁵. Photographic records and satellite elements are therefore likely to prove an offense. The use of these shots in litigation ordering the investigation is usual but the formation of judgment and conviction of the judge

²⁷ Markowitz Kenneth J., « Legal Challenges And Market Rewards To The Use and Acceptance Of Remote Sensing And Digital Information as Evidence », in *DUKE ENVIRONMENTAL LAW & POLICY FORUM*, vol. 12 : 219, Spring 2002, p. 254

²⁸ *I&M Rail Link v. Northstar Navigation*, 21 F. Supp. 2d 849, 855 (N.D. Ill. 1998). 187. ; *In re Vernon Sand & Gravel, Inc.*, 93 B.R. 580, 583 (Bankr. N.D. Ohio 1988)

²⁹ *Nutra Sweet Co. v. X-L Eng'g Co.*, 227 F.3d 776, 788 (7th Cir. 2000)

³⁰ Jobard F., Schulze-Icking N. *Preuves hybrides. L'administration de la preuve pénale sous l'influence des techniques et des technologies (France, Allemagne, Grande-Bretagne)*, Centre de Recherches Sociologiques sur le Droit et les Institutions Pénales (CNRS-UMR 2190), 2004, n° 96, p. 160

³¹ Walker C., Mc Guinness, M., "Risk, political violence and policing the City of London" in Crawford, A., (ed.), *Crime, Insecurity, Safety and the New Governance* (Willan Publishing, Cullompton, 2002), 234-259

³² Gautron V., « La fin de la singularité du modèle français de prévention de la délinquance », in *AJ Pénal*, 17 Septembre 2007, p. 205, quoting Cusson, « La surveillance et la télésurveillance : sont-elles efficaces ? », *RI crim. et pol. techn.*, 2005, n° 2, p. 131 ; M. Gill, A. Spriggs, *Assessing the impact of CCTV*, Home Office Resarch Study 292, 2005.

³³ Jobard F., Schulze-Icking N. *Preuves hybrides. op. cit.*, 179-181

³⁴ South African Marine Living Resources Act, 18 of 1998, sections 74-76

³⁵ French Criminal Procedure Code, art. 427

is always based on the record. Evidence by the image does not seem to be established without the presence of a statement of an agent expressly authorized by the law³⁶. Under French law, this almost absolute probative value emerges from the fact that the reports have value of proof until evidence of the contrary is provided. This state is accentuated if photographs – that could be satellite³⁷ – attached to the minutes explicitly link "*clearly and unambiguously*" its findings.

Like the cases handled by the common law jurisdictions, where no finding of a breach by an authorized officer can be found, the admissibility of the photograph or any information presenting a maritime interest, place the scientific expertise at the heart of debates. In this case, this would amount to recognize to the voice of an expert a similar probative force as the enforcement officer one's. The debate initiated, however, is hardly new. It refers to the difference between probative force and probative value, which is significant especially within the legal continental systems. Faced with widespread use of remote monitoring systems, a new question arises from litigations where no intervention of enforcement officers *in situ* is possible. Developments of these global control practices could lead to judicial excesses. If humans can be monitored at sea, is it in the same conditions as on land? Can a satellite photograph provide evidence of an offense with as much reliability as the photograph of the traffic radar systems³⁸? The immediate answer to this question might be negative. Yet the importance of the experts during litigations, asked to provide the necessary keys of the understanding of non legal but exclusively technical elements, seems to pave the way for a reconsideration of this state jurisprudentially recognized.

2. Scientific expertise and establishment of truth

Under French law, the scientific expert involved in a dispute seems to strengthen the probative value of an official report. He will help to expand the details of the factual elements that the judge examines to form his own opinion. Two recent cases³⁹ do not follow the line of the previous rulings established by the *Traquair*⁴⁰ case in 1996. In this latter case, photograph has been recognized as sufficiently reliable and detailed to establish responsibilities. The presumption of evidence by the image seems to have been finally swept. The *Normanna* case also demonstrates the importance of scientific expertise without which, by applying the *Traquair* reasoning, responsibility, for a spill that was not composed of oil, would have been retained. Yet the official report noticed a marine pollution corroborated by aerial photographs. During the trial, the expert stated "*no photograph presents a sheen made*

³⁶ French environmental Code, art. L. 218-26: "1 °The *administrators* of Maritime Affairs; 2°The officers of the technical and administrative body of Maritime Affairs; 3°Inspectorsof Maritime Affairs; [...] 7 °officials, officers and commissioned services and maritime port authorities; 8°, state engineers assigned to the regional industry, research and environmental interest; 9 °port officers and port officers assistants; 10° official researchers, engineers and technicians in French Research Institute for Exploitation of the Sea, 11 °Customs officers; 12°abroad,the Consuls of France, excluding consular agents; 13°trustees of seafarers"

³⁷ French Court of Appeal, Poitiers, *Iriondo Gurruchaga*, 2 avril 1993

³⁸ Even though Automatic Control and Sanction System is subject to uncertainties. See Péliissier P., Circulation routière, in *Répertoire de droit pénal et de procédure pénale*, Ed. Dalloz, update January 2012, n° 291; ONISR, *Impact du contrôle sanction automatisé sur la sécurité routière (2003-2005)*, March 2006, 87p.; Cass. Crim., 29 April 2009, n° 08-87. 235 (« Fiabilité des contrôles par radars : une mise en cause difficile » in *AJ Pénal*, 2009, p. 310)

³⁹ Melennec O., « Les photos n'ont pas convaincu », in *Le Marin*, January 6, 2012, p. 6

⁴⁰ CA Rennes, *Traquair*, September 19, 1996

*of iridescence (evidence of transformation of light, characteristic of the hydrocarbon) or semi-liquid mud. There were no "classic" hydrocarbon visible in the photos of the release"*⁴¹.

The emphasis on expertise in legal proceedings has a considerable and growing importance. Under U.S. law, it is so important that the lack of experience of the person interpreting satellite photographs can exclude its use as evidence⁴². Some procedures are even testing the skills of the expert and the result could have a direct impact on its regularity. The qualifications of the expert will even determine the value of the evidence. These procedures could be seen as a protective reflex, a safeguard of humanity against a technologized Justice. A 2005 report of British Members⁴³ of the House of Commons highlights the central role of the expert during the formation of the judgment.

He brings the elements necessary to the understanding of the technical fact. During a procedure, the expert's knowledge is undeniably serving the Justice. The course of the trial shows that a certain legal alchemy goes beyond the immediate scope of the scientific presentation. Indeed, C. Pamplin, editor of the UK Register of Expert Witnesses in 2005 states that *"undoubtedly, there are some expert witnesses which when they stand up in court bring with them a very strong persuasive element to their evidence. And their evidence takes on a greater weight because of the way they deliver it"*⁴⁴. In continental law, the situation of the scientific expert in the witness box is no different. It is then likely that the oral presentation counterbalances some scientific uncertainties. In contrast, *"an expert with sound scientific knowledge is sometimes completely destabilized by the environment of the courtroom. In some cases, the eloquence of figures may pale in comparison to the eloquence of the high-flying barristers"*⁴⁵.

Besides, there are technologies that do not - or no more - require the interpretation of an expert simply because they are broadly accepted. For example, VMS use technologies such as the GPS. This latter technology is so well established in the societal mores that no rule requires a test of the dependability of the system⁴⁶. Yet in fisheries control, the use of the GPS raises some difficulties, as it is not that accurate⁴⁷. The control of the equipment can still be exercised to exclude an argument about its outdated or run-down state⁴⁸. Under French law, the plaintiff must in any case submit evidence in rebuttal to the accuracy of the GPS

⁴¹ CA Rennes (3ème ch.), 22 mars 2007, *Navire Normanna*, in *Droit Maritime Français*, 691 [avril 2008], 338-349

⁴² *Velsicol Chem. Corp. v. State of New Jersey D.E.P.*, 442 A.2d 1053 (N.J. 1982)

⁴³ House of Commons, Science and Technology Committee, *Forensic Science on Trial*, seventh Report of Session 2004-05, 94 p., [online:] <http://www.publications.parliament.uk/pa/cm200405/cmselect/cmsctech/96/96i.pdf>

⁴⁴ House of Commons, Science and Technology Committee, *Forensic Science on Trial*, seventh Report of Session 2004-05, p. 63

⁴⁵ Savart M., « L'expertise scientifique en matière pénale », in *AJ Pénal*, 15 février 2006, pp. 74-75

⁴⁶ Cass. crim., 14 sept. 1999, inédit

⁴⁷ Note the development of an enhanced version of the GPS (the DGPS) that enable a more accurate tracking of the vessels at sea. See: the innovative use and the precision of the DGPS employed in a land vehicle guiding system: Goldbeck J., Huertgen B., Ernst S., Kelch L., « Lane following combining vision and DGPS », in *Image and vision computing*, vol. 18, Issue 5, April 2000, pp. 425-433

⁴⁸ CA Caen, November 25, 2002, *Juris-Data* n° 2002-203895

positioning⁴⁹. The GPS data record and length of detention within a system is also taken into account and may lead to opposite arguments held before the court⁵⁰.

Under U.S. law, most courts assess the broad acceptance enjoyed by the evidence, i.e. its observed technical value commonly accepted by the scientific community⁵¹. The necessity of the use of an expert is then deduced. Some procedures are well-determined by the jurisprudence. The *Frye* test provides an initial identification of the field in which falls the theory emphasizing the new technique. This allows them to determine whether or not this new technique is commonly recognized by the scientists. U.S. *Daubert*⁵² test follows almost exactly the same procedure as the test. It however includes the global recognition demonstrated notably by the fact that the theory has been published and that the likely rate of errors of its application is known. In the *Daubert* case, the Court made a reversal of the procedure on *Frye* since it “*has noted that the “austere standard” of the Frye procedure was contrary to the liberal Federal Rules of Evidence and warned against the establishment of a stifling and repressive scientific orthodoxy*”⁵³.

These US well-defined procedures do not seem to be established so accurately in the UK⁵⁴ or in France. However, even though there is no legal norms or case-law establishing the procedure to assess the legal validity of a scientific theory, “*to admit a new technique or a totally new methodology, [the judge] relies on objective, practical and reasonable, at least understandable and convincing to the defendant as to the community of citizens. In this approach, a dialogue is factually initiated with the relevant specialists*”⁵⁵.

Concluding Remarks

The trend towards a return to the ordinary law of evidence in France justifies the use of information processing and sensing systems as mere tools. They are indeed not automated control devices handling crimes at sea like it is the case for the land traffic. They originally intend to improve the projection and the coordination of operational means at sea. They also ground the basis for the emergence of a real network of sea surveillance systems. The transmission of information, which requires interoperability of national systems, is the key. Satellite technologies reinforce the belief in a cleaner, safer and more secure world. The numerous applications developed and commercialized on the security and safety market entail yet more complex control procedures. This involves the drawing up of technical standards of the relations between all the maritime actors and their activities, whether they are private or public.

⁴⁹ CA Poitiers, June 25, 1993: Juris-Data n° 1993-051863

⁵⁰ Cass. crim., January 16, 2007, Juris-Data n° 2007-037509: “the vessel hadn’t fished in the international waters of William D. [...] as the analysis of the GPS allowed to observe; however the tribunal had besides observed that the GPS data, that had been erased, did not make possible to know the vessel’s route; such contradictory arguments cannot firmly establish that the ship fished in the French EEZ”.

⁵¹ *Frye v. United States*, 54 App. D.C. 46, 293 F. 1013 (D.C. Cir. 1923)

⁵² *Daubert v Merrell Dow Pharmaceuticals Inc* (1992) 509 US 579

⁵³ Canivet G. (First President of the Court of cassation), « Le juge entre progrès scientifique et mondialisation », in RTD Civ., March 15, 2005, p. 33

⁵⁴ House of Commons, Science and Technology Committee, *Forensic Science on Trial*, seventh Report of Session 2004-05, p. 76, n° 173

⁵⁵ Canivet G., « Le juge entre progrès scientifique... », *op. cit.*